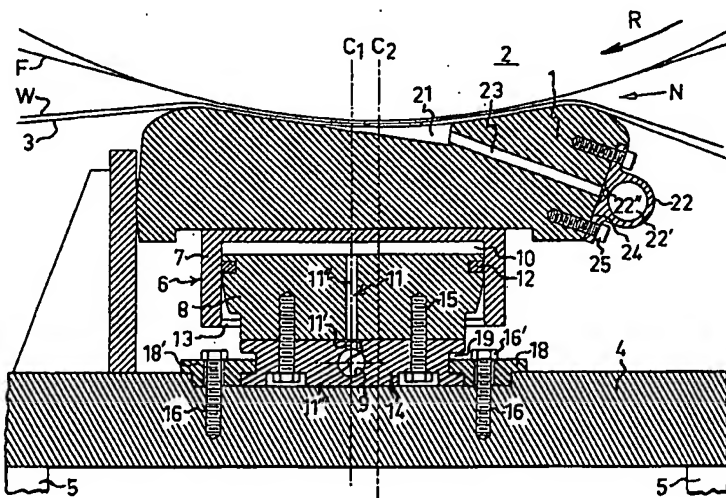




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: SHOE PRESS



## (57) Abstract

A shoe press for a paper or board machine, comprising a press shoe (1) and a counter roll (2), which between themselves form an extended nip (N) for a paper or cardboard web and a circulated flexible belt (3), and at least one loading cylinder (6) which is arranged between a horizontal beam (4) included in the frame system (4, 5) of the shoe press and the press shoe (1) and adapted to press the press shoe (1) against the counter roll (2). The press shoe is arranged on top of the loading cylinder and there is a device for securing the loading cylinder (6) on the horizontal beam (4), said securing being releasable. With the aid of eccentric means (16, 18, 19) arranged on both sides of, seen in the machine direction, the loading cylinder/each loading cylinder (6), the loading cylinder is actuatable, after releasing the securing, for moving it in the machine direction for regulating the pressure profile of the shoe press.

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SHOE PRESS

The present invention relates to a shoe press for a paper or board machine, comprising a press shoe and a counter roll, which between themselves form an extended nip for a paper or cardboard web and a circulated flexible belt, at least one loading cylinder arranged between a horizontal beam included in the frame system of the shoe press and the press shoe and adapted to press the press shoe against the counter roll, the press shoe being arranged on top of the loading cylinder, and a device for securing the loading cylinder on the horizontal beam, said securing being releasable.

A shoe press with a device for moving a press shoe relative to the shoe press centre line, containing the centre line of the counter roll, is known from Fig. 6 in DE-A1-331 74 57, in which the device comprises a hydraulic-fluid-actuatable tube and a spring. Various other devices for moving the centre of gravity of the supporting force acting on the press shoe relative to the press shoe are disclosed in US-A-4,713,147, in which a press shoe support between the press shoe and the frame system of the shoe press is movable in the cross-direction relative to the press shoe. In a variant, the press shoe support is a hydraulic-fluid-actuatable loading cylinder for pressing the press shoe against the counter roll.

The above-mentioned possibilities of movement serve to allow variation of the pressure profile on the paper or cardboard web in the nip between the press shoe and the counter roll, said variation in turn aiming at optimally pressing different paper/cardboard qualities.

The invention is based on said variant according to US-A-4,713,147, and its object is to simplify and make the device for moving the centre line of the loading

cylinder relative to the centre line of the press less expensive.

The object is achieved by a shoe press of the type described by way of introduction and having the distinctive features that eccentric means are arranged on both sides of, seen in the machine direction, the loading cylinder/each loading cylinder, by means of which eccentric means the loading cylinder is actuatable, after the securing has been released, for its movement in the machine direction for regulating the pressure profile of the shoe press. Advantageous embodiments have the distinctive features stated in the dependent claims.

The invention will now be described in more detail with reference to the accompanying drawings, in which Fig. 1 is a cross-sectional view of a non-limiting embodiment of the invention, seen in the machine direction, Fig. 2 is a cross-sectional view of a variant in the machine direction, Fig. 3 is a cross-sectional view of the variant along line III-III in Fig. 2, in the cross-direction, and Fig. 4 is a top plan view of an eccentric plate, section IV-IV in Fig. 2.

It is understood that the press shoe is made in one piece, while there are preferably a plurality of loading cylinders, distributed in the longitudinal direction of the press shoe in a row or in several rows which are spaced apart in the cross-direction of the press shoe.

Fig. 1 illustrates a shoe press for the press section of a paper or board machine, said machine comprising the conventional shoe press components press shoe 1, counter roll 2 having the direction of rotation R, which between themselves form an extended nip N, in which a paper or cardboard web W that is to be dewatered runs together with a circulated flexible press belt 3 and one or two press felts F, of which one is shown. A horizontal beam 4, which is part of the frame system 5 of the shoe press, has between its side facing the press shoe and the opposite side of the press shoe, a plurality of loading

cylinders 6, which are arranged in a row in the longitudinal direction of the shoe press and which have a cylinder part 7 and a piston 8, the latter being releasably attached to the beam 4 in a manner that will be described in more detail below. The press shoe 1 is in this case loosely arranged on the loading cylinder part 7, which may have, in a manner known per se, a hydrostatic compartment in its surface facing the press shoe 1 for floatingly suspending the press shoe. In the piston 8 extends a horizontal duct 9 which is formed in the longitudinal direction of the shoe (cross-direction) and intended for supplying the working chambers 10 of the loading cylinders with hydraulic fluid, e.g. oil, via a vertical duct 11 in the piston 8, the duct 9 being common to the working chambers of all the loading cylinders, while there is a vertical duct 11 for each working chamber, connecting the common duct 9 with the working chamber. An O-ring 12 seals between the piston 8 and the cylinder part 7.

Reference is once more made to Fig. 1. The common duct 9 is formed in a separate horizontal bar 14, and the vertical ducts 11 consist of two duct parts 11' and 11'', the duct part 11' being bored through the wall of the bar to the duct 9 in the bar, and the duct part 11'' being bored in the piston 8. In this fashion, vertical ducts 11' can be bored in advance in the bar 14 and sealed for use later on, if, for instance, further loading cylinders 6 are to be mounted, or they can be bored only on such occasions. The bar 14 thus forms part of all pistons 8, screws 15 providing for connection of the piston parts.

Advantageously the bar 14 is made of aluminium (alloy) which can be extruded for obtaining the desired sectional shape of the bar 14 and the desired diameter of the common duct 9. When boring the vertical ducts 11', a space for an O-seal 11''' is arranged at the end of these ducts 11'. The duct 9 is supplied with hydraulic fluid from a source (not shown) at one of its ends.

A further possibility of commonly supplying a plurality of loading cylinders 6 is shown in Figs 2 and 3, in which a shoe press having at least two loading cylinders 6 is indicated, two being shown. The common duct 9 is formed of bores 9' in the pistons 8 and of duct components 9" which extend between the loading cylinders 6 and mutually connect the bores 9'. The duct component 9''' is a T piece, the leg of which, as indicated by dash-dotted lines, serves to connect the duct 9 to a hydraulic fluid source. The ends of the duct components 9" are simply inserted into the bores 9', which have widened ends 9a with an abutment 9b and an O-ring 9c for sealing purposes. This embodiment allows in an advantageous manner connection of the hydraulic fluid source in the duct 9 between two optional neighbouring loading cylinders 6 and also allows in an advantageous manner the absorption of forces caused by heat deformation. Otherwise the same reference numerals are used as in Fig. 1 for the same press shoe components.

The securing of the pistons 8 on the beam 4 is, according to the invention, effected in such a manner that the loading cylinders 6 can, if desired, be moved relative to the press shoe 1 in the machine direction, thereby moving the centre lines C1 of the loading cylinders 6 relative to the centre line C2 of the shoe press. This can be desired for the reasons described above.

The securing device consists in the illustrated embodiments of a suitable number of screws 16 and screw plates 18 on opposite sides, in the machine direction, of each piston 8, and of a groove 19 formed in the piston 8 on each said piston side. The holes 18' of the plates 18 let the screws 16 through, which are screwed in the beam 4, and the plates 18 engage in the grooves 19 in the sides of the pistons 8, such that when tightening the screws by the screw heads 16', the latter clamp the plates 18 between themselves and the beam 4, whereby the piston 8 is fixedly secured on the beam 4.

The plates 18 are identically polygonal and, as shown, eccentric. The centre line C1 of the loading cylinders 6 can thus be moved relative to the centre line C2 of the shoe press, if desired, by loosening the screws 16 by their heads 16' and rotating the plates about the screws 16 for permitting the desired displacement of the loading cylinder 6 in the desired direction of movement (machine direction). If the loading cylinder 6 in Fig. 1 is to be moved, for instance, in the running direction of the paper web, the right plate 18 is rotated about its screw 16 in such a manner that a lateral edge thereof which is positioned further away from the screw axis engages in the right groove 19, and the left plate 18 is rotated about its screw 16 such that the lateral edge thereof which is positioned correspondingly closer to the screw axis engages in the left groove 19.

The eccentric plates 18 can be identical with each other, or they can be of two kinds which are mirror images of each other. Fig. 1 illustrates the plates and the bar 14 partly put into a recess in the beam 4, which, of course, is not necessary, as is evident from Figs 2 and 3. In the embodiment according to Fig. 1, the plates 18 engage in the grooves 19 in the common bar 14. The circumferential part of the plates, which is not intended to engage in the grooves 19, can be circular.

In an alternative to eccentric plates, for instance a single eccentrically flanged sectional rod or bar can be arranged on the respective sides of the loading cylinders to engage in the grooves 19 in the pistons 8 by means of one flange and be screwed in the beam 4 by means of another flange, in which case the desired movement of the loading cylinders can be effected by rotation, after loosening the screws, of the rods about their longitudinal axis.

Fig. 2 can be considered to represent one more embodiment, in which the components 18, 18' are not plates, but two eccentrically flanged sectional rods/bars which

are shown in cross-section and, thus, are common to all the loading cylinders. The movement of the loading cylinders is effected, after loosening the screws 16, by letting the bars 18 and 18' change places, whereupon the screws 16 are tightened once more. Such an arrangement thus allows movement of the loading cylinders between two positions in the machine direction.

If, in contrast to the embodiments described above, it is desirable to have a fixed connection between the loading cylinders and the press shoe, the fixed connection can be effected by means of securing devices of the types shown.

By arranging the common duct 9 for feeding the working chamber/working chambers 10, it is achieved in an advantageous manner that the beam 4 is not weakened by a corresponding bore. The arrangement for supplying one or more hydrostatic compartments 21 arranged in the side of the press shoe 1 facing the counter roll 2 with hydraulic fluid for lubricating the press belt 3 serves the same purpose. The compartments 21 are supplied with hydraulic fluid through a pipe 22, the hydraulic fluid conducting bore 22' of which (the hydraulic fluid source is not shown) is connected to each compartment by means of a duct 23 formed in the press shoe and a through hole 22" which is formed in the wall of the pipe 22 and which can be designed as a throttle. The pipe 22 is attached to one side of the press shoe, in this case the upstream side, by means of pipe flanges 24 and screws 25. The pipe 22 can be common to all compartments 21 (Fig. 1) or can be separate for each compartment 21 (Fig. 2), in which case the separate pipes 22 communicate with each other via pipe components 22a like the duct components 9", thereby making it possible to absorb heat-conditioned deformation forces applied to the pipe 22.

Alternatively, the pipe 22 or pipes 22 and the joint pipes 22a can supply hydrostatic compartments 26 between the press shoe and the opposite side of the load-



ing cylinders 6 via ducts 27 (indicated by dashed lines) formed in the press shoe and bores formed in the pipe/ pipes, or another pipe or a plurality of other pipes with joint pipes can be arranged on the opposite longitudinal  
5 side edge of the press shoe for this purpose.

The inventive shoe press is applicable also to calendering operations in a paper or board machine.

## CLAIMS

1. A shoe press for a paper or board machine, comprising a press shoe (1) and a counter roll (2), which between themselves form an extended nip (N) for a paper or cardboard web and a circulated flexible belt (3), and at least one loading cylinder (6) which is arranged between a horizontal beam (4) included in the frame system (4, 5) of the shoe press and the press shoe (1) and adapted to press the press shoe (1) against the counter roll (2), the press shoe being arranged on top of the loading cylinder, and a device for securing the loading cylinder (6) on the horizontal beam (4), said securing being releasable, characterised by eccentric means (16, 18, 18', 19) on both sides of, seen in the machine direction, the loading cylinder/each loading cylinder (6), with the aid of which eccentric means the loading cylinder is actuatable, after releasing the securing, for moving it in the machine direction for regulating the pressure profile of the shoe press.

2. A shoe press as claimed in claim 1, characterised in that the eccentric means (16, 18, 18', 19) are included in the securing device.

3. A shoe press as claimed in claim 1 or 2, characterised in that the eccentric means (16, 18, 18', 19) comprise at least two sectional rods (18, 18') which are flanged in a varying eccentric manner and arranged on the respective sides of the loading cylinders, seen in the machine direction, and which are common to all said loading cylinders, the flange of said profile rods (18, 18') engaging in grooves (19) formed in said sides of the loading cylinders.

4. A shoe press as claimed in claim 1 or 2, characterised in that the eccentric means comprise plates (18) with an eccentric circumference, which by means of an edge part engage in grooves (19)

formed in opposite sides of the piston (8) of the loading cylinder (6) and which are rotatable about screws (16) which are screwed in the horizontal beam (4).

5        5. A shoe press as claimed in claim 4, characterised in that the circumference of the plates (18) forms a polygon.

6. A shoe press as claimed in any one of claims 1-5, characterised in that the working chamber of the loading cylinder (6) is supplied with hydraulic fluid  
10 by means of a horizontal duct (9) formed in the piston (8) of the loading cylinder.

7. A shoe press as claimed in claim 6, characterised in that the horizontal duct (9) is formed in a bar (14) which forms part of the piston (8)  
15 or, if there are arranged a plurality of loading cylinders, forms a part which is common to all pistons (8).

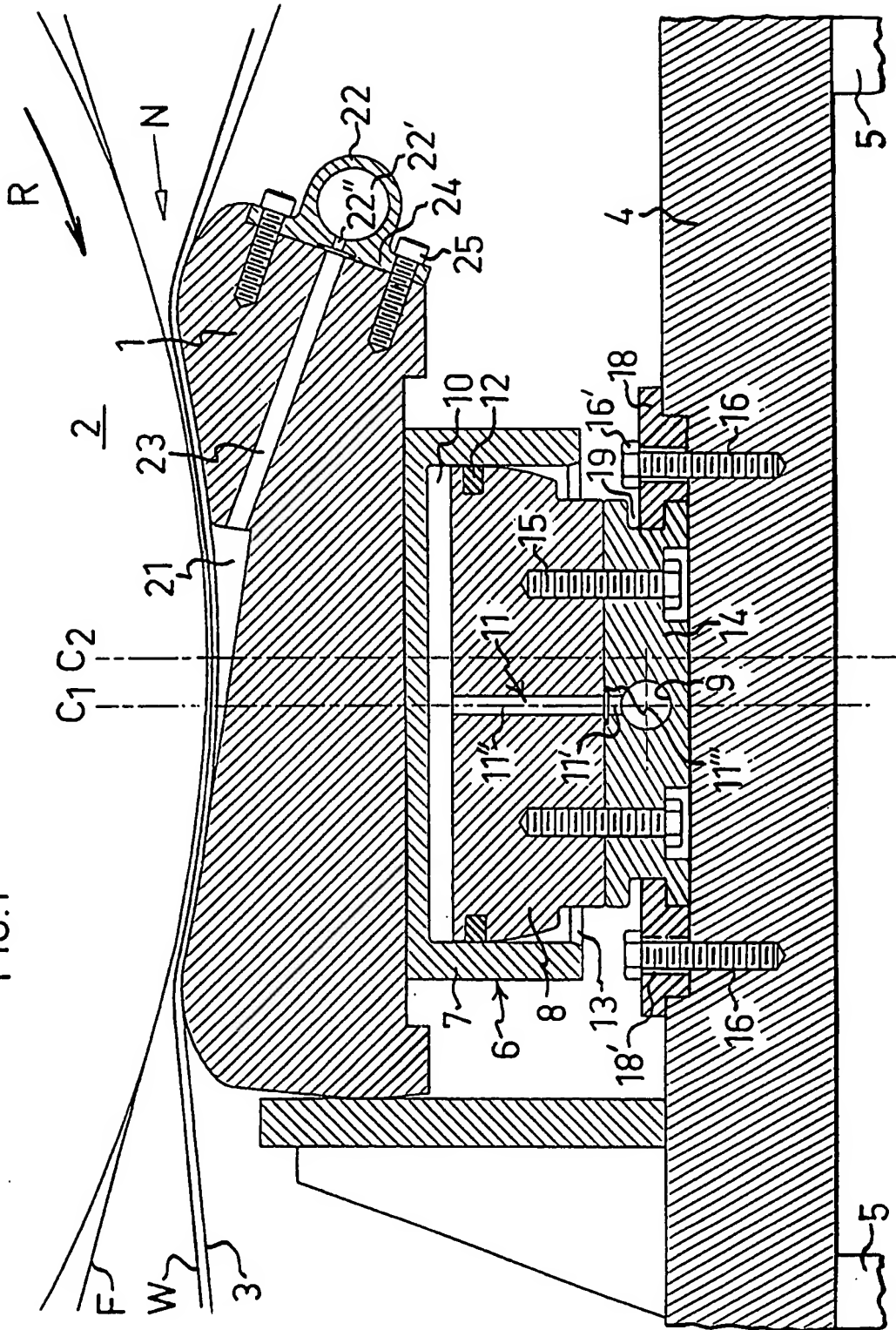
8. A shoe press as claimed in claim 7, characterised in that said grooves (19) are formed in a bar (14).

20        9. A shoe press as claimed in claim 7 or 8, characterised in that the bar (14) is made of aluminium.

10. A shoe press as claimed in claim 9, characterised in that the bar (14) is extruded.

1/2

FIG.1





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01762

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21F 3/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 19515832 C1 (VOITH SULZER PAPIERMASCHINEN GMBH), 2 May 1996 (02.05.96) --	1
A	EP 0345501 A1 (VALMET PAPER MACHINERY INC.), 13 December 1989 (13.12.89) --	1
A	US 4713147 A (ESKO SAARINEN), 15 December 1987 (15.12.87) -- -----	1

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

01/12/98

International application No.  
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